

Five Species of Phytoseiid Mites from Japan with Descriptions of Two New Species (Acarina, Phytoseiidae)

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ABSTRACT — Two new species of phytoseiid mites were described from Japan: *Typhlodromus* (*Anthoseius*) *higoensis* n. sp. from bamboo in Kumamoto Prefecture, Kyushu, and *Amblyseius* (*Amblyseius*) *hirotai* n. sp. from *Ischaemum antheophoroides* (Steud.) Miq. and others in Tottori Prefecture, Honshu. *Typhlodromus* (*Paraseiulus*) *soleiger* (Ribaga), new to Japan, was redescribed on the basis of specimens from Hokkaido. Further, the males of *Amblyseius* (*Amblyseius*) *koyamanus* Ehara et Yokogawa and *Amblyseius* (*Indoseiulus*) *litorivorus* Ehara were described and figured for the first time.

INTRODUCTION

A total of sixty-three species of the mite family Phytoseiidae were previously known to occur in Japan [1-5]. In this paper descriptions and records are given of five Japanese species of the family, including two new species and one species new to this country. The materials on which the study is based were taken from plants in Hokkaido, Honshu and Kyushu. The type-series of the new species are deposited in the collection of the Biological Institute, Faculty of Education, Tottori University.

Typhlodromus (*Anthoseius*) *higoensis* n. sp.

(Japanese name: Higo-kaburidani)

(Figs. 1-6)

Female Dorsal shield reticulate, with five pairs of solenostomes. Setae on dorsal shield: L_{10} stout, capitate, with minute barbs; remaining setae smooth; M_2 shorter than L_8 , and shorter than distance between bases of M_2 and L_8 ; L_9 slightly shorter than, or as long as L_8 . Setae S_1 and S_2 on interscutal membrane. Peritreme extending between setae D_1 ; posterior extension of

peritrematal shield with a transverse suture, ending in a truncate tip. Sternal shield with posterior margin concave, with three pairs of setae; metasternal platelets longer than wide. Ventrianal shield longer than wide, wider than genital shield, with lateral margins nearly straight; four pairs of preanal setae; a pair of very small solenostomes slightly intero-posteriad from posteromedian pair of preanals, but one of the solenostomes being often absent as in Figure 3. Seta VL_1 capitate. Two pairs of slender metapodal platelets. Spermatheca as figured. Chelicera with seven teeth on fixed digit, three on movable digit. Chaetotaxic formula: genu II, 2-2/0, 2/0-1; genu III, 1-2/1, 2/0-1. Basitarsus IV with a capitate macroseta. Measurements in μm : length of idiosoma 360, width of idiosoma 240; length of setae¹ ($n=10$): L_1 14.1 ± 0.2 , L_2 12.4 ± 0.2 , L_3 13.4 ± 0.1 , L_4 13.6 ± 0.2 , L_5 15.8 ± 0.2 , L_6 18.1 ± 0.3 , L_7 19.9 ± 0.3 , L_8 27.1 ± 0.3 , L_9 24.4 ± 0.3 , L_{10} 55.2 ± 1.0 , M_1 11.6 ± 0.2 , M_2 19.0 ± 0.3 , D_1 19.1 ± 0.2 , D_2 10.1 ± 0.1 , D_3 11.1 ± 0.1 , D_4 13.2 ± 0.2 , D_5 14.4 ± 0.2 , D_6 9.9 ± 0.2 , S_1 16.6 ± 0.2 , S_2 15.7 ± 0.1 , VL_1 42.3 ± 1.0 , macroseta on basitarsus IV 41.7 ± 0.6 .

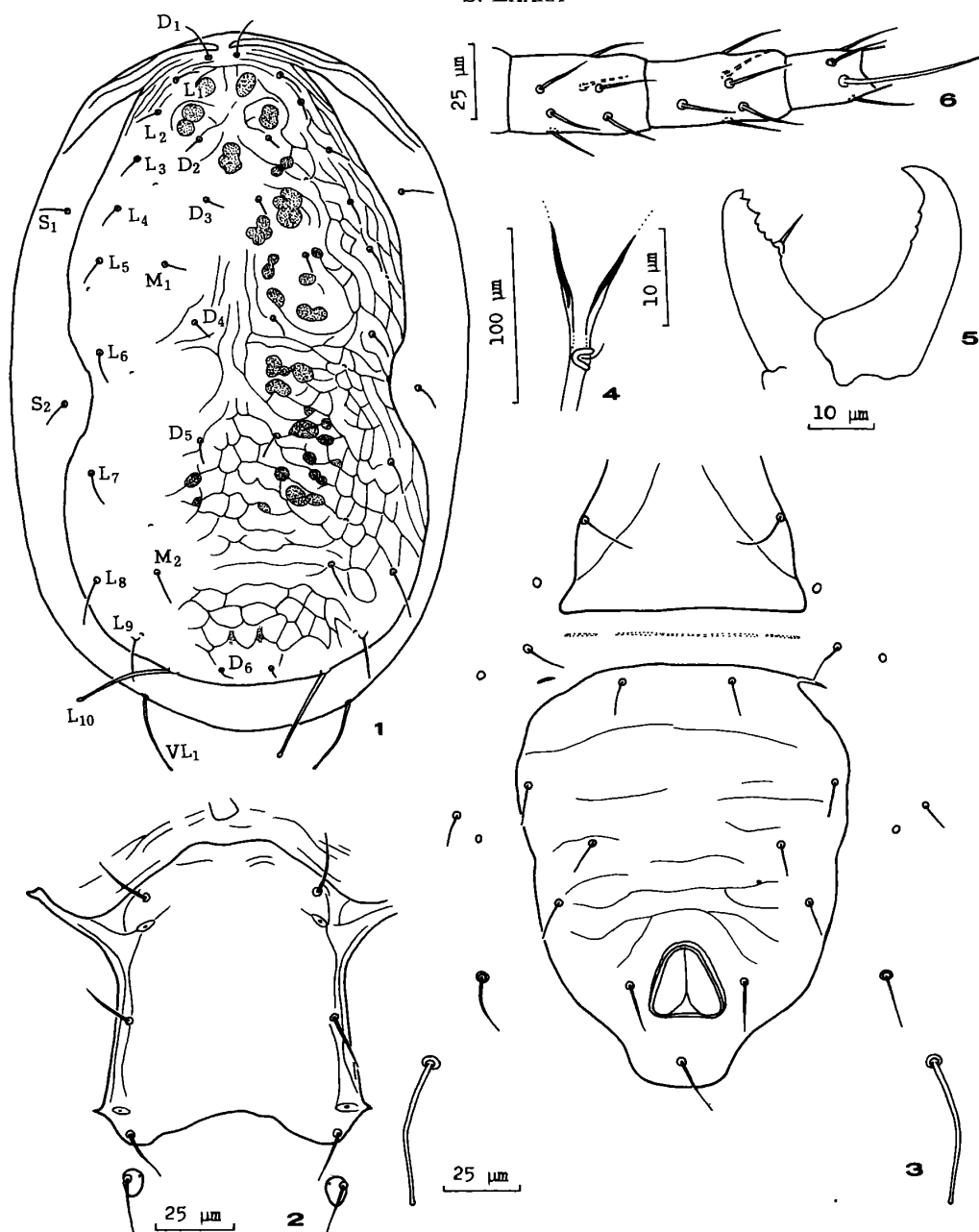
Male Not known.

Type-series Holotype: ♀, Kumamoto University campus, Kurokami-chō, Kumamoto City,

Accepted August 23, 1984

Received July 23, 1984

¹ Mean \pm S.E.



FIGS. 1-6. *Typhlodromus (Anthoseius) higoensis* n. sp. (♀). 1: Dorsum of idiosoma. 2: Sternal shield. 3: Posterior ventral surface. 4: Spermatheca. 5: Chelicera. 6: Genu, tibia and basitarsus of leg IV.

Kyushu, 13-V-1983 (S. Ehara), on bamboo. Paratypes: 6♀♀, 23-VIII-1983, other data the same as for holotype.

Remarks *Typhlodromus higoensis* n. sp. is not closely related to any described species belonging to the subgenus *Anthoseius* with three pairs of setae on the sternal shield. This species is distinctive in the combination of the following characters: Seta L_{10} capitate, much longer than the other dorsal setae; M_2 shorter than L_8 ;

ventrianal solenostomes very small, widely separated; spermathecal cervix nearly V-shaped; and leg IV with only one macroseta.

***Typhlodromus (Paraseiulus) soleiger* (Ribaga)**
(Japanese name: Shirakaba-kaburidani)
(Figs. 7-12)

Seiulus soleiger Ribaga, 1902 [6], p. 176.

Typhlodromus soleiger: Nesbitt, 1951 [7], p. 39, pl.

XII, figs. 30, 32; Chant *et al.*, 1974 [8], p. 1283, figs. 62–65; Chant and Yoshida Shaul, 1982 [9], p. 3027, figs. 13–16.

Typhlodromus (Typhlodromus) soleiger: Chant, 1959 [10], p. 59, figs. 66–67.

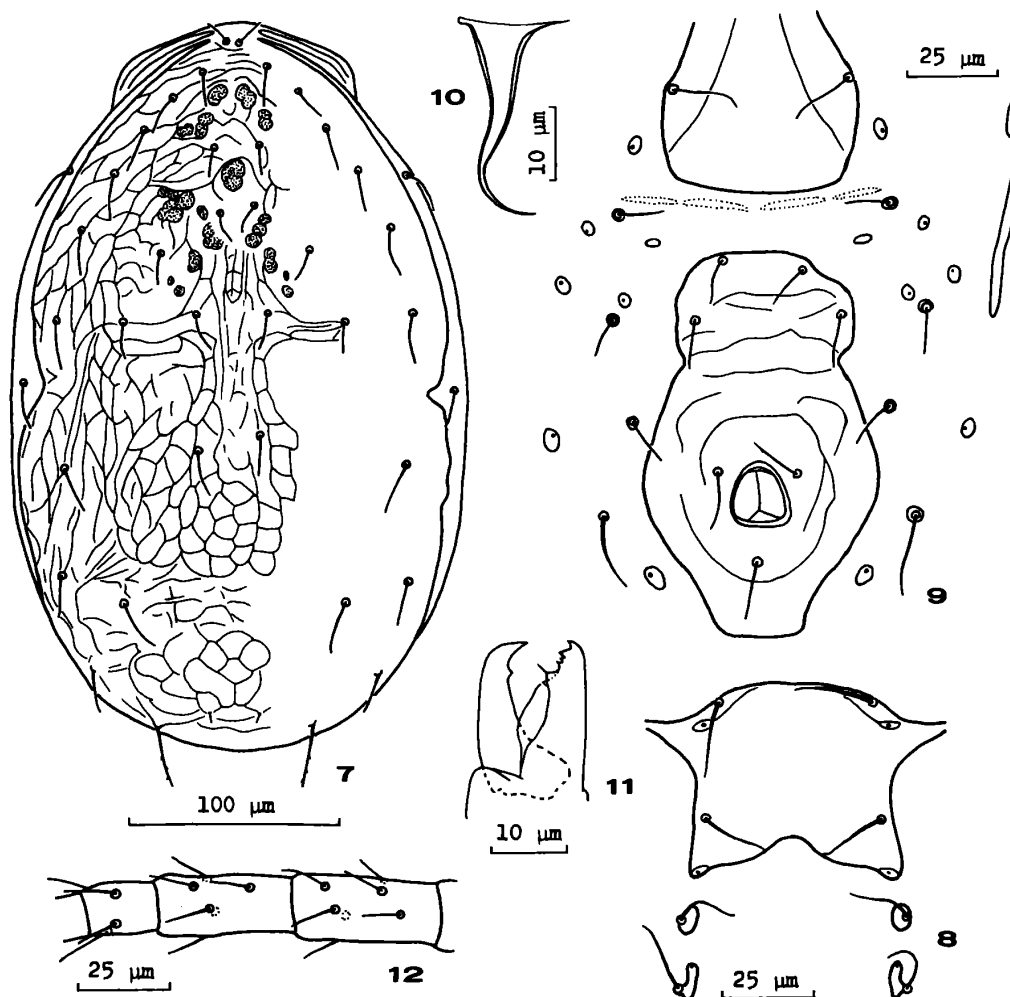
Paraseiulus soleiger: Muma, 1961 [11], p. 300; Karg, 1971 [12], p. 216, figs. 233a, 234a, 235a.

Typhlodromus (Paraseiulus) soleiger: van der Merwe, 1968 [13], p. 60.

Paraseiulus (Paraseiulus) soleiger: Wainstein, 1976 [14], p. 698.

Female Body heavily sclerotized. Dorsal shield reticulate, without solenostomes. Setae on dorsal shield: L_{10} the largest, barbed; M_3 and L_9 slightly barbed or smooth; the remaining setae smooth, L_8 more or less shorter than distance between bases of L_8 and M_3 . Setae S_1 and S_2 on interscutal membrane. Paritreme not extending

beyond seta D_1 ; posterior extension of peritrematal shield without transverse suture. Sternal shield with posterior margin concave, with two pairs of setae; third pair of sternal setae on platelets; metasternal platelets slender, sometimes absent. Ventrianal shield slender, slightly wider than genital shield, with lateral margins constricted to form a waist, widest at level of anus; two pairs of preanal setae anterior to the waist; no solenostomes. Two pairs of slender metapodal platelets, the posterior pair very long. Spermatheca as figured. Fixed digit of chelicera with two or three subapical, contiguous teeth and one middle tooth; the movable digit with one tooth. Chaetotaxic formula: genu II, 2–2/1, 2/0–1; genu III, 1–2/1, 2/0–1. Leg IV without macrosetae. Measurements in μm : length of idiosoma 320,



FIGS. 7–12. *Typhlodromus (Paraseiulus) soleiger* (Ribaga) (♀). 7: Dorsum of idiosoma. 8: Sternal shield. 9: Posterior ventral surface. 10: Spermatheca. 11: Chelicera. 12: Basitarsus, tibia and genu of leg IV.

width of idiosoma 190; length of setae ($n=10$): L_1 18.0 ± 0.4 , L_2 17.4 ± 0.4 , L_3 19.3 ± 0.4 , L_4 20.7 ± 0.5 , L_5 22.6 ± 0.4 , L_6 22.9 ± 0.5 , L_7 23.4 ± 0.4 , L_8 21.4 ± 0.3 , L_9 20.5 ± 0.4 , L_{10} 26.5 ± 0.6 , M_1 13.8 ± 0.3 , M_2 16.1 ± 0.3 , M_3 24.3 ± 0.5 , D_1 13.3 ± 0.2 , D_2 13.3 ± 0.3 , D_3 13.2 ± 0.3 , D_4 16.2 ± 0.1 , D_5 19.5 ± 0.4 , D_6 6.3 ± 0.2 , S_1 20.3 ± 0.6 , S_2 17.3 ± 0.3 , VL_1 20.7 ± 0.4 .

Male Not available in the present study.

Specimens examined Eight ♀♀, Hokkaido University campus, Sapporo, Hokkaido, 30-V-1982 (T. Gotoh), on *Betula platyphylla* Sukatchev var. *japonica* (Miq.) Hara; 7 ♀♀, 9-IX-1983 (T. Gotoh & S. Ehara), other data the same as for the above.

Remarks *Typhlodromus soleiger* is recorded from Japan for the first time. Previously this species was known from Europe, England, U. S. S. R., Canada, the United States, and China.

Amblyseius (Amblyseius) koyamanus

Ehara et Yokogawa

(Figs. 13 and 14)

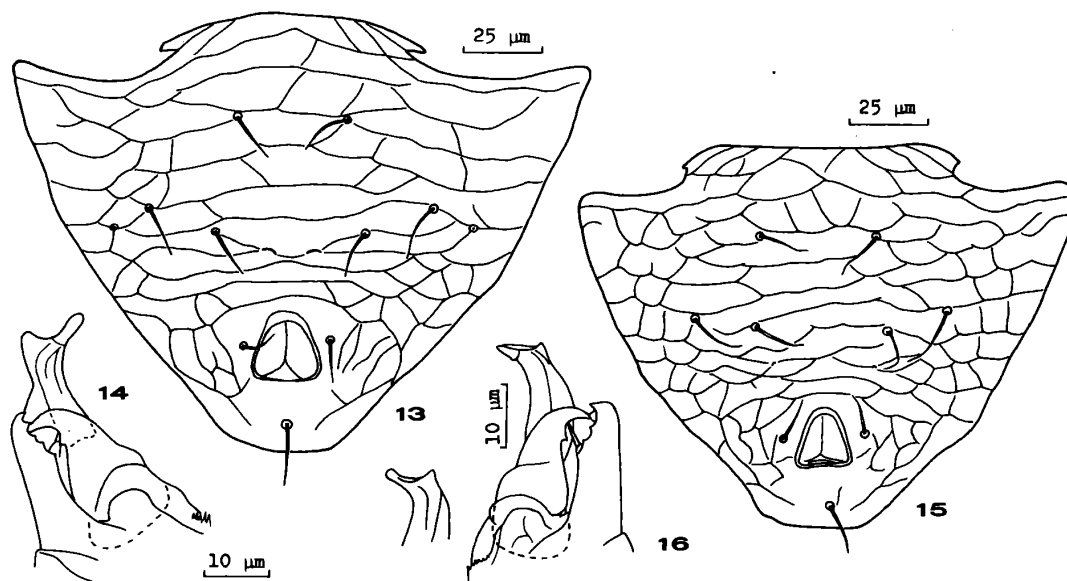
Amblyseius (Amblyseius) koyamanus Ehara and Yokogawa, 1977 [15], p. 50, figs. 1-8.

Male Setae S_1 and S_2 on dorsal shield.

Peritreme not extending to seta D_1 . Ventrianal shield not fused with peritrematal shield, with three pairs of preanal setae; a pair of distinct, crescentic solenostomes between and slightly posteriad from posterior pair of preanals. Chelicera with four teeth on fixed digit, one on movable digit; spermatodactyl as figured. Measurements in μm : length of idiosoma 300, width of idiosoma 200; length of setae ($n=10$): L_1 17.5 ± 0.5 , L_2 16.2 ± 0.3 , L_3 16.2 ± 0.3 , L_4 19.0 ± 0.3 , L_5 15.4 ± 0.2 , L_6 18.4 ± 0.4 , L_7 18.8 ± 0.4 , L_8 17.4 ± 0.3 , L_9 35.9 ± 0.7 , M_1 12.6 ± 0.2 , M_2 25.2 ± 0.7 , D_1 14.6 ± 0.4 , D_2 12.2 ± 0.3 , D_3 12.0 ± 0.2 , D_4 13.1 ± 0.3 , D_5 15.6 ± 0.3 , D_6 10.3 ± 0.2 , S_1 16.6 ± 0.4 , S_2 15.9 ± 0.3 , VL_1 22.1 ± 0.4 , macroseta on basitarsus IV 35.4 ± 0.5 .

Specimens examined Four ♂♂, Tottori Sand Dune, Tottori Pref., Honshu, 9-IX-1979 (M. Hirota), on *Ischaemum anthephoroides* (Steud.) Miq.; 5 ♀♀ & 3 ♂♂, 21-VII-1981 (S. Ehara), 6 ♀♀ & 3 ♂♂, 1-IX-1981 (S. E.), 2 ♀♀ & 1 ♂, 26-VII-1983 (S. E.), other data the same as for the above; 1 ♂, 25-IX-1979 (M. H.), on *Pinus thunbergii* Parl., locality the same as for the above.

Additional materials: many ♀♀ & ♂♂, Tottori Sand Dune, IX~X-1979 (M. H.), on *Ischaemum anthephoroides* (Steud.) Miq., *Digitaria adscendens* (H. B. K.) Henr., *Eragrostis curvula*



FIGS. 13 and 14. *Amblyseius (Amblyseius) koyamanus* Ehara et Yokogawa (♂). 13: Ventrianal shield. 14: Chelicera.

FIGS. 15 and 16. *Amblyseius (Amblyseius) hirotai* n. sp. (♂). 15: Ventrianal shield. 16: Chelicera.

(Schröd.) Nees, *Pinus thunbergii* Parlat., *Linaria japonica* Miq., *Vitex rotundifolia* Linn., and *Artemisia capillaris* Thunb.; many ♀♀ & ♂♂, Okayama City, Honshu, 14~17-X-1983 (Y. Okada), on *Echinochloa crus-galli* (Linn.) Beauv. var. *crus-galli*, *Miscanthus sinensis* Anderss., *Eragrostis multicaulis* Steud., *Digitaria adscendens* (H. B. K.) Henr., and *Andropogon virginicus* Linn.

Remarks *Amblyseius koyamanus* was described originally based on females taken from graminaceous plants at Koyama, Tottori City.

The male of this species is described and figured for the first time.

***Amblyseius (Amblyseius) hirotae* n. sp.**

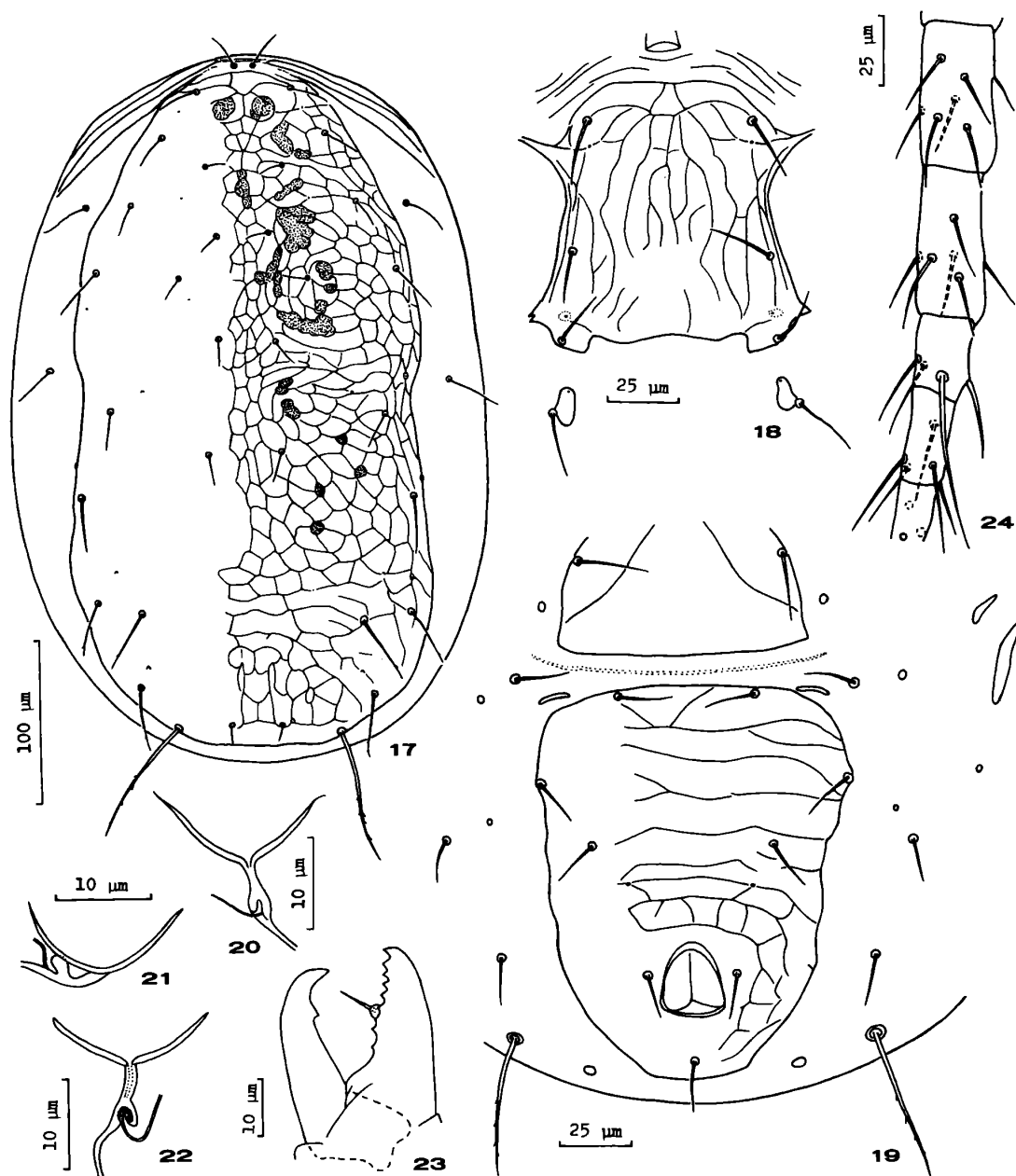
(Japanese name: Nise-koyama-kaburidani)

(Figs. 15–24)

Amblyseius (Amblyseius) sp.: Ehara *et al.*, 1980 [16], p. 67, figs. 3–6.

Amblyseius sp.: Ehara, 1983 [17], p. 64.

Female Dorsal shield reticulate, with seven



FIGS. 17–24. *Amblyseius (Amblyseius) hirotae* n. sp. (♀). 17: Dorsum of idiosoma. 18: Sternal shield. 19: Posterior ventral surface. 20–22: Spermatheca. 23: Chelicera. 24: Genu, tibia and basitarsus of leg IV.

pairs of solenostomes. Setae on dorsal shield: L_9 barbed, much larger than the others; M_2 barbed, longer than distance between its base and that of L_7 ; L_7 and L_8 barbed; the remaining setae smooth. Setae S_1 and S_2 on interscutal membrane. Peritreme not extending to seta D_1 ; posterior extension of peritrematal shield slender, without transverse suture. Sternal shield with three pairs of setae; metasternal platelets longer than wide. Ventrianal shield longer than wide, wider than genital shield, with lateral margins slightly concave or nearly straight, with three pairs of preanal setae; a pair of minute solenostomes behind and slightly mediad to posterior pair of preanals. Seta VL_1 barbed. Two pairs of slender metapodal platelets. Spermatheca with cervix semicircular. Fixed digit of chelicera with seven or eight teeth; the movable digit with one tooth. Chaetotaxic formula: genu II, 2-2/0, 2/0-1; genu III, 1-2/1, 2/0-1. Leg IV with one macroseta on basitarsus. Measurements in μm : length of idiosoma 400, width of idiosoma 250; length of setae ($n=10$): L_1 27.3 ± 0.5 , L_2 19.8 ± 0.3 , L_3 18.3 ± 0.3 , L_4 30.2 ± 0.4 , L_5 20.8 ± 0.3 , L_6 29.7 ± 0.4 , L_7 31.4 ± 0.4 , L_8 33.8 ± 0.5 , L_9 74.0 ± 0.9 , M_1 13.5 ± 0.2 , M_2 34.8 ± 0.4 , D_1 21.8 ± 0.2 , D_2 13.2 ± 0.2 , D_3 13.1 ± 0.1 , D_4 15.9 ± 0.1 , D_5 18.7 ± 0.4 , D_6 12.0 ± 0.2 , S_1 28.2 ± 0.4 , S_2 26.3 ± 0.4 , VL_1 48.6 ± 0.8 , macroseta on basitarsus IV 61.0 ± 0.5 .

Male Setae S_1 and S_2 on dorsal shield. Peritreme not extending to seta D_1 . Ventrianal shield not fused with peritrematal shield, with three pairs of preanal setae; a pair of minute solenostomes behind and slightly mediad of posterior pair of preanals. Fixed digit of chelicera with four teeth; movable digit unidentate; spermatodactyl as figured. Measurements in μm : length of idiosoma 300, width of idiosoma 200; length of setae ($n=8$): L_1 25.5 ± 0.6 , L_2 18.1 ± 0.4 , L_3 17.4 ± 0.3 , L_4 27.2 ± 0.4 , L_5 19.7 ± 0.4 , L_6 27.1 ± 0.5 , L_7 30.8 ± 0.7 , L_8 33.4 ± 1.0 , L_9 62.8 ± 1.2 , M_1 13.1 ± 0.3 , M_2 40.4 ± 0.5 , D_1 20.1 ± 0.3 , D_2 12.3 ± 0.2 , D_3 12.6 ± 0.3 , D_4 15.0 ± 0.7 , D_5 18.3 ± 0.3 , D_6 10.2 ± 0.5 , S_1 25.5 ± 0.4 , S_2 22.8 ± 0.5 , VL_1 41.2 ± 1.0 , macroseta on basitarsus IV 57.8 ± 0.4 .

Type-series Holotype: ♀, Tottori Sand Dune, Tottori Pref., Honshu, 26-VII-1983 (S. Ehara), on *Ischaemum antheophoroides* (Steud.) Miq.

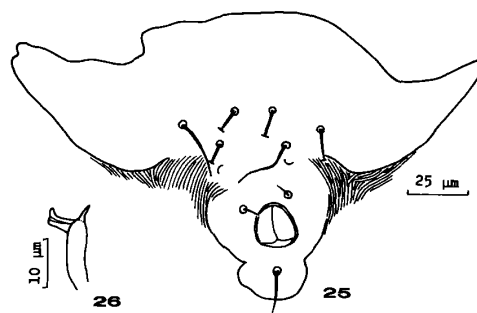
Paratypes: 8♀♀ & 2♂♂, data the same as for holotype; 5♀♀ & 1♂, 1-IX-1981 (S. E.), 3♀♀ & 1♂, 23-X-1979 (M. Hirota), other data the same as for holotype; 3♀♀ & 1♂, 23-X-1979 (M. H.), on *Digitaria adscendens* (H. B. K.) Henr., 3♀♀, 25-IX-1979 (M. H.), 2♀♀, 1-XI-1979 (M. H.), on *Eragrostis curvula* (Schr.) Nees, locality the same as for holotype.

Remarks *Amblyseius hirotai* n. sp. differs from the very closely related *A. bicaudus* Wainstein, 1962 [18], in that the cervix of the spermatheca is semicircular, whereas in the latter it is nearly U-shaped [19, 20].

***Amblyseius (Indoseiulus) liturivorus* Ehara**
(Figs. 25 and 26)

Amblyseius (Indoseiulus) liturivorus Ehara, 1982 [5], p. 43, figs. 10-18.

Male Setae S_1 and S_2 on dorsal shield. Peritreme not extending to level of seta L_2 . Ventrianal shield not fused with peritrematal shield, indented laterad of distinct solenostomes; three pairs of preanal setae; paranals flanking anterior end of anus. Spermatodactyl as figured. Measurements in μm : length of idiosoma 310, width of idiosoma 240, length of dorsal shield 303, width of dorsal shield 208; length of setae ($n=2$): D_1 30.3, L_4 25.7, L_9 40.0, M_2 22.7, VL_1 24.3, macrosetae on leg IV: genu 38.6, tibia 40.0, basitarsus 45.8.



FIGS. 25 and 26. *Amblyseius (Indoseiulus) liturivorus* Ehara (♂). 25: Ventrianal shield. 26: Spermatodactyl.

Specimens examined Two ♀♀ & 1♂, Taishi, Osaka Pref., Honshu, 30-IX-1982 (K. Inoue), on grape (in vinyl house).

Remarks *Amblyseius liturivorus* was known

only from females found on soy bean in a greenhouse of Wakayama Prefecture, Honshu. The male is described and figured for the first time. The single male specimen studied here is not in good condition.

ACKNOWLEDGMENTS

I am very grateful to Prof. H. Mori and Dr. T. Gotoh (Hokkaido University), Mr. K. Inoue (Akitsu Branch, Fruit Tree Research Station), Miss M. Hirota (Shūnan Training School, Tokuyama), and Mr. Y. Okada (Takashiro Elementary School, Kurayoshi), for providing me with some of the specimens dealt with in the present paper. This study was supported by a Grant-in-Aid for Developmental Scientific Research (No. 58860010) from the Ministry of Education, Science and Culture, Japan.

REFERENCES

- Ehara, S. (1977) A review of taxonomic studies on natural enemies of spider mites in Japan. *Rev. Plant Protec. Res.*, **10**: 29–48.
- Ehara, S. (1978) Two new species of phytoseiid mites from Hokkaido (Acarina: Phytoseiidae). *Proc. Japan Acad.*, **54B**: 446–450.
- Ehara, S. and Hamaoka, K. (1980) A new *Typhlodromus* from Japan with notes on four other species of phytoseiid mites. *Acta Arachnol.*, **29**: 3–8.
- Ehara, S. (1981) Description of a new *Typhlodromus* from “miso” factories, with synonymy of *T. bambusae* Ehara (Acarina: Phytoseiidae). *Jpn. J. Sanit. Zool.*, **32**: 235–237.
- Ehara, S. (1982) Two new species of phytoseiid mites from Japan (Acarina: Phytoseiidae). *Appl. Ent. Zool.*, **17**: 40–45.
- Ribaga, C. (1902) Gamasidi planticoli. *Riv. Patol. Veg.*, **10**: 175–178.
- Nesbitt, H. H. J. (1951) A taxonomic study of the Phytoseiinae (family Laelaptidae) predaceous upon Tetranychidae of economic importance. *Zool. Verh.*, **12**: 1–64, 32 pls.
- Chant, D. A., Hansell, R. I. C. and Yoshida, E. (1974) The genus *Typhlodromus* Scheuten (Acarina: Phytoseiidae) in Canada and Alaska. *Can. J. Zool.*, **52**: 1265–1291.
- Chant, D. A. and Yoshida, E. (1982) A world review of the *soleiger* species group in the genus *Typhlodromus* Scheuten (Acarina: Phytoseiidae). *Can. J. Zool.*, **60**: 3021–3032.
- Chant, D. A. (1959) Phytoseiid mites (Acarina: Phytoseiidae). Part I. Bionomics of seven species in southeastern England. Part II. A taxonomic review of the family Phytoseiidae, with descriptions of 38 new species. *Can. Entomol.*, **91**, Suppl. 12: 1–166.
- Muma, M. H. (1961) Subfamilies, genera, and species of Phytoseiidae (Acarina: Mesostigmata). *Bull. Fla. State Mus. Biol. Sci.*, **5**: 267–302.
- Karg, W. (1971) Acari (Acarina), Milben, Unterordnung Anactinochaeta (Parasitiformes). Die freilebenden Gamasina (Gamasides), Raubmilben. *Die Tierwelt Deutschlands und der angrenzenden Meeresteile*, **59**: 1–475.
- van der Merwe, G. G. (1968) A taxonomic study of the family Phytoseiidae (Acari) in South Africa with contributions to the biology of two species. *Entomol. Mem. Dep. Agric. Tech. Serv. Repub. S. Afr.*, **18**: [i–iv], 1–198.
- Wainstein, B. A. (1976) A new tribe of the family Phytoseiidae (Parasitiformes). *Zool. Zh.*, **55**: 696–700. (In Russian with English summary)
- Ehara, S. and Yokogawa, M. (1977) Two new *Amblyseius* from Japan with notes on three other species (Acarina: Phytoseiidae). *Proc. Jap. Soc. Syst. Zool.*, **13**: 50–58.
- Ehara, S., Hikichi, K., Nomura, Y. and Hirota, M. (1980) A zoological survey of Tottori Sand Dune. *Rep. Spec. Res. Nat. Monum. Tottori Sand Dune*, **1979**: 65–77. (In Japanese)
- Ehara, S. (1983) Physical and chemical properties, animals and plants of sand dune. *Animals of Tottori Sand Dune. Sand Dune Res.*, **30**: 62–67. (In Japanese)
- Wainstein, B. A. (1962) Some new predatory mites of the family Phytoseiidae (Parasitiformes) of the U.S.S.R. fauna. *Rev. Entomol. URSS*, **41**: 230–240. (In Russian with English summary)
- Livschitz, I. Z. and Kuznetsov, N. N. (1972) Phytoseiid mites from Crimea (Parasitiformes: Phytoseiidae). *Trudy gos. Nikit. bot. Sada*, **61**: 13–64. (In Russian with English summary)
- Kolodochka, L. A. (1978) Handbook for identification of plant-inhabiting phytoseiid mites. *Naukova Dumka, Kiev*, pp. 1–80. (In Russian)